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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
10/765,671	01/26/2004	Jonathan A. Hack		9883

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EXAMINER

JACKSON JR, JEROME

ART UNIT	PAPER NUMBER
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2815

DATE MAILED: 01/17/2006

Please find below and/or attached an Office communication concerning this application or proceeding.

Office Action Summary	Application No.	Applicant(s)	
	10/765,671	HACK, JONATHAN A.	
	Examiner	Art Unit	
	Jerome Jackson Jr.	2815	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

- 1) ☒ Responsive to communication(s) filed on 10 November 2005.
- 2a) ☒ This action is **FINAL**. 2b) ☐ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

- 4) ☒ Claim(s) 1-25 is/are pending in the application.
- 4a) Of the above claim(s) _____ is/are withdrawn from consideration.
- 5) ☐ Claim(s) _____ is/are allowed.
- 6) ☒ Claim(s) 1-25 is/are rejected.
- 7) ☐ Claim(s) _____ is/are objected to.
- 8) ☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☐ The drawing(s) filed on _____ is/are: a) ☐ accepted or b) ☐ objected to by the Examiner.
Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).
Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
- 11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

- 12) ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☐ All b) ☐ Some * c) ☐ None of:
- ☐ Certified copies of the priority documents have been received.
 - ☐ Certified copies of the priority documents have been received in Application No. _____.
 - ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

- | | |
|--|---|
| 1) <input checked="" type="checkbox"/> Notice of References Cited (PTO-892) | 4) <input type="checkbox"/> Interview Summary (PTO-413) |
| 2) <input type="checkbox"/> Notice of Draftsperson's Patent Drawing Review (PTO-948) | Paper No(s)/Mail Date. _____ |
| 3) <input checked="" type="checkbox"/> Information Disclosure Statement(s) (PTO-1449 or PTO/SB/08) | 5) <input type="checkbox"/> Notice of Informal Patent Application (PTO-152) |
| Paper No(s)/Mail Date <u>11/10/05</u> | 6) <input type="checkbox"/> Other: _____ |

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The following is a quotation of the first paragraph of 35 U.S.C. 112:

The specification shall contain a written description of the invention, and of the manner and process of making and using it, in such full, clear, concise, and exact terms as to enable any person skilled in the art to which it pertains, or with which it is most nearly connected, to make and use the same and shall set forth the best mode contemplated by the inventor of carrying out his invention.

Claims 1-25 are rejected under 35 U.S.C. 112, first paragraph, as failing to comply with the written description requirement. The claim(s) contains subject matter which was not described in the specification in such a way as to reasonably convey to one skilled in the relevant art that the inventor(s), at the time the application was filed, had possession of the claimed invention. Broadening the claims to recite a "magnetic material comprising: a semiconductor..." is new matter as applicant does not have basis for claiming any non-amorphous magnetic material and it is unclear what applicant intends to claim by not specifying "amorphous" material. The intentions and scope of the claims is unclear and considered new matter. Likewise claiming material not containing the magnetic atoms Cr, Mn, etc. and removing the limitation "amorphous" broadens the scope to non amorphous materials and it is unclear what non-amorphous material applicant intends. It is also unclear how the newly claimed material can possibly be ferromagnetic without ferromagnetic atoms Cr, Mn, etc. not in the material. The newly claimed structure appears to be new matter in addition to being non-enabled.

Claims 1-25 are rejected under 35 U.S.C. 112, first paragraph, as failing to comply with the enablement requirement. The claim(s) contains subject matter which was not described in the specification in such a way as to enable one skilled in the art to which it pertains, or with which it is most nearly connected, to make and/or use the invention. The previous rejection still applies. The bottom line is applicant discloses and

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claims amorphous group IV magnetic semiconductor material disclosed for use in spintronic devices for which there is no enablement. Applicant should carefully respond to all the all the points of the previous rejection. Applicant has not enabled any device structure or material disclosed. Mere allegation that the new claims do not refer to spintronic devices or spark processed silicon are unpersuasive of patentability. There is no evidence that applicant's disclosed devices or material for devices can be made, particularly with the new claim recitations that magnetic atoms "Cr, Mn ,Co, Ni or Fe" are not present. Applicant needs to present evidence such as hysteresis data that this claimed ferromagnetic material can be made and used for spintronic devices. Absent convincing experimental data this rejection will be maintained. There is simply no evidence that applicant can build a ferromagnetic semiconductor without magnetic material as claimed. Furthermore, applicant's specification discloses amorphous magnetic semiconductor material. The new claims are not limited to amorphous material and there is no enablement for either amorphous magnetic semiconductor as disclosed or "ferromagnetic semiconductor material" as now claimed. Furthermore, it is not seen how a dopant of alkaline earth metal, alkali metal, or rare earth element can possibly enable a conductivity of $10E-10$ to $10E4$ in a semiconductor displaying ferromagnetic behavior. These elements are not ordinary dopants and have not been shown to enable this fourteen order of magnitude conductivity in any semiconductor, particularly since they would normally be deep level dopants in silicon. Claims 5, 6, 22 and 23 are non-enabled. Claims 12 and 13 are non-enabled because there is no enablement for II-VI or III-V ferromagnetic semiconductors without transition metals such as Mn, Co, Ni, etc.

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Again applicant needs to submit experimental evidence because the prior art shows only dilute magnetic semiconductors with transition metals, and furthermore, the fourteen order of magnitude conductivity recitation may not have been enabled anywhere in the art for dilute magnetic semiconductors, amorphous or crystalline. See Prinz U.S. 4,823,177, previously cited. Claims 14 and 15 are non-enabled as it is unclear whether the structure is a metal or semiconductor and there is clearly no enablement for either. The intended structure is vague and indefinite and so undetermined as to not be enabled or understood. Claims reciting nanoparticles are non-enabled as the structure of the nanoparticles beyond ordinary dopant atoms (Group II, III, V, VI) is not disclosed. What is the structure of a Group II or Group VI "nanoparticle". The disclosure is non-enabling. What are the structures of the claimed nanoparticles ? Applicant's material is unclear and non-enabled.

The following is a quotation of the second paragraph of 35 U.S.C. 112:

The specification shall conclude with one or more claims particularly pointing out and distinctly claiming the subject matter which the applicant regards as his invention.

Claims 1-25 are rejected under 35 U.S.C. 112, second paragraph, as being indefinite for failing to particularly point out and distinctly claim the subject matter which applicant regards as the invention.

The claims are vague and indefinite as previously because there is no enablement and no way to determine the device or material structure. Claim 25 is also vague and indefinite, lacking antecedent, and does not make sense. What "metal" does the claim refer to ? There is no enablement for a "metal" with ferromagnetic behavior

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that does not contain Cr, Mn, etc. In fact there is no enablement for any material as claimed in any of the claims.

Claims 1-4, 7-11, 16, 18-21, and 24, as best understood, are rejected under 35 U.S.C. 102(b) as anticipated by or, in the alternative, under 35 U.S.C. 103(a) as obvious over Hack et al '97, of record.

The previous rejection still applies as Hack teaches a ferromagnetic semiconductor material which is doped either p-type and/or n-type from the starting material of p-type wafers or nitrogen anneal. The claimed magnitudes of conductivity cover 14 orders of magnitude and accordingly the material of Hack is considered to have a magnitude somewhere in the range, particularly considering the starting wafers were p-type 5.5×10^{15} .

Claim 25 is rejected under 35 U.S.C. 102(b) as being anticipated by Kittel 1962.

Kittel shows in table 15.1 magnetic material such as Dy, Gd, or UH₃.

Claims 18-23 as best understood, are rejected under 35 U.S.C. 102(b) as anticipated by or, in the alternative, under 35 U.S.C. 103(a) as obvious over Park et al Science 1/25/02.

Park shows a ferromagnetic material comprising MnGe material. Claims 18-23 as best understood do not structurally distinguish over Park. The ferromagnetic material is p-type with carrier density 10^{19} - 10^{20} , and therefore should be in the claimed conductivity range. Claims 22 and 23 are rejected as Mn is a transition element.

Claims 1-4,7-11,13,16,18-21,24, as best understood, are rejected under 35 U.S.C. 102(b) as anticipated by or, in the alternative, under 35 U.S.C. 103(a) as obvious over Hack '746.

The previous rejection still applies. The Hack material is doped with nitrogen as disclosed in column 3 lines 49-51.

Applicant's arguments filed 11/10/05 have been fully considered but they are not persuasive. Applicant's arguments that the invention is not directed to spintronic devices is unpersuasive as the title of the invention is "Spintronic devices...". See also the figures and description of the figures. Applicant's admission that the disclosed spintronic devices do not work basically admits that the disclosure is non-enabling, at least for spintronic devices. The disclosed ferromagnetic material is disclosed for practice in spintronic devices. The devices are non-enabled and until applicant submits experimental hysteresis data for the claimed material and disclosed devices, the rejection for non-enablement will be maintained. The submitted articles show that magnetic behavior has been observed in semiconductor material. The Bolduc article also references (4,11-13) articles in which ferromagnetism is observed in Group IV semiconductor materials. Nonetheless, because applicant has claims which omit ordinary transition metals such as Fe, Ni, etc. there is still a question of enablement as the disclosure is for amorphous semiconductor with these elements, particularly for spintronic devices. Applicant also states that the disclosure is not directed to spark processed silicon. This admission also leads to a question of enablement as there is direct disclosure of spark processing and

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the article by Hack shows that such processing apparently can produce amorphous ferromagnetic silicon material. The broad disclosure of other other processes are not considered enabling as such ferromagnetic material is unusual and clearly should require extraordinary processing. There is no clear blueprint how to make exactly make this unusual material, particularly for inclusion in spintronic devices. Mere recitation of ordinary processing such as CVD or sputtering is insufficient of enablement as ferromagnetic amorphous semiconductor, particularly without transition metal inclusion, is not expected to be ferromagnetic under ordinary device processing. Lack of an exact process blueprint is clear grounds for lack of enablement. See also the previous rejection.

Reference to the article by Tsubaki is not proof of enablement as Tsubaki discloses that "ferromagnetism" in his device is only a "possibility". Tsubaki's structure is also not "amorphous" as applicant's invention is directed to. Reference to Bolduc is also not convincing of enablement as Bolduc's material is also crystalline and implanted with transition metal. Applicant's invention is directed to amorphous material. Bolduc does not teach amorphous material. The crystalline material is rejected as shown above as there are references such as Park predating Bolduc.

Applicant's arguments regarding "nanoparticles" are not convincing of patentability as "nanoparticles of silicon" do not distinguish over mere atoms of silicon. There is no enablement teaching exactly the structure of applicant's "nanoparticles" of silicon if in fact they are different from mere atoms of silicon of which any silicon device is made. There is no enablement.

Arguments regarding Hack are also not convincing. Applicant states that Hack's device does not have the required conductivity. This is unlikely because the Hack device is processed with p-doped silicon wafers 5.5×10^{15} . Hack inherently has a conductivity in the range claimed. Unless applicant can absolutely prove otherwise, this rejection will stand.

Arguments regarding Hack '746 are unconvincing as the Hack material is apparently doped with nitrogen. Again, unless applicant proves otherwise, the doping level in the material disclosed by Hack should determine the conductivity to lie in the fourteen order of magnitude range claimed.

Applicant's amendment necessitated the new ground(s) of rejection presented in this Office action. Accordingly, **THIS ACTION IS MADE FINAL**. See MPEP § 706.07(a). Applicant is reminded of the extension of time policy as set forth in 37 CFR 1.136(a).

A shortened statutory period for reply to this final action is set to expire **THREE MONTHS** from the mailing date of this action. In the event a first reply is filed within **TWO MONTHS** of the mailing date of this final action and the advisory action is not mailed until after the end of the **THREE-MONTH** shortened statutory period, then the shortened statutory period will expire on the date the advisory action is mailed, and any extension fee pursuant to 37 CFR 1.136(a) will be calculated from the mailing date of the advisory action. In no event, however, will the statutory period for reply expire later than **SIX MONTHS** from the date of this final action.

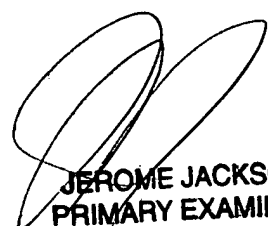
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Any inquiry concerning this communication or earlier communications from the examiner should be directed to Jerome Jackson Jr. whose telephone number is 571-272-1730. The examiner can normally be reached on M-Th.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Tom Thomas can be reached on 571-272-1664. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see <http://pair-direct.uspto.gov>. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free).

jj



**JEROME JACKSON
PRIMARY EXAMINER**